



## SEQUENCE LISTING

&lt;110&gt; Takeda Chemical Industries, Ltd.

&lt;120&gt; Betacellulin Mutein

&lt;130&gt; P2001-232

&lt;140&gt; US/09/857,815A

&lt;141&gt; 2001-06-08

&lt;150&gt; JP 10-350377

&lt;151&gt; 1998-12-09

&lt;150&gt; JP 11-55326

&lt;151&gt; 1999-03-03

&lt;160&gt; 64

&lt;210&gt; 1

&lt;211&gt; 77

&lt;212&gt; PRT

&lt;213&gt; Human

&lt;400&gt; 1

Asp	Gly	Asn	Ser	Thr	Arg	Ser	Pro	Glu	Thr	Asn	Gly	Leu	Leu	Cys	Gly
1				5					10					15	
Asp	Pro	Glu	Glu	Asn	Cys	Ala	Ala	Thr	Thr	Thr	Gln	Ser	Lys	Arg	Lys
			20					25					30		
Gly	His	Phe	Ser	Arg	Cys	Pro	Lys	Gln	Tyr	Lys	His	Tyr	Cys	Ile	Lys
	35						40				45				
Gly	Arg	Cys	Arg	Phe	Val	Val	Ala	Glu	Gln	Thr	Pro	Ser	Cys	Val	Cys
	50					55					60				
Asp	Glu	Gly	Tyr	Ile	Gly	Ala	Arg	Cys	Glu	Arg	Val	Asp			
65					70					75					

&lt;210&gt; 2

&lt;211&gt; 76

&lt;212&gt; PRT

&lt;213&gt; Human

&lt;400&gt; 2

Asp	Gly	Asn	Ser	Thr	Arg	Ser	Pro	Glu	Thr	Asn	Gly	Leu	Leu	Cys	Gly
1				5					10					15	
Asp	Pro	Glu	Glu	Asn	Cys	Ala	Ala	Thr	Thr	Thr	Gln	Ser	Lys	Arg	Lys
			20					25					30		
Gly	His	Phe	Ser	Arg	Cys	Pro	Lys	Gln	Tyr	Lys	His	Tyr	Cys	Ile	Lys
	35						40				45				
Gly	Arg	Cys	Arg	Phe	Val	Val	Ala	Glu	Gln	Thr	Pro	Ser	Cys	Val	Cys
	50					55					60				
Asp	Glu	Gly	Tyr	Ile	Gly	Ala	Arg	Cys	Glu	Arg	Val				
65					70					75					

<210> 3  
 <211> 47  
 <212> PRT  
 <213> Human

<400> 3  
 Arg Lys Gly His Phe Ser Arg Cys Pro Lys Gln Tyr Lys His Tyr Cys  
 1 5 10 15  
 Ile Lys Gly Arg Cys Arg Phe Val Val Ala Glu Gln Thr Pro Ser Cys  
 20 25 30  
 Val Cys Asp Glu Gly Tyr Ile Gly Ala Arg Cys Glu Arg Val Asp  
 35 40 45

<210> 4  
 <211> 46  
 <212> PRT  
 <213> Human

<400> 4  
 Arg Lys Gly His Phe Ser Arg Cys Pro Lys Gln Tyr Lys His Tyr Cys  
 1 5 10 15  
 Ile Lys Gly Arg Cys Arg Phe Val Val Ala Glu Gln Thr Pro Ser Cys  
 20 25 30  
 Val Cys Asp Glu Gly Tyr Ile Gly Ala Arg Cys Glu Arg Val  
 35 40 45

<210> 5  
 <211> 79  
 <212> PRT  
 <213> Artificial sequence

<220>  
 <223> amino acid sequence of betacellulin mutein (BTC 1-76, 78-80)

<400> 5  
 Asp Gly Asn Ser Thr Arg Ser Pro Glu Thr Asn Gly Leu Leu Cys Gly  
 1 5 10 15  
 Asp Pro Glu Glu Asn Cys Ala Ala Thr Thr Thr Gln Ser Lys Arg Lys  
 20 25 30  
 Gly His Phe Ser Arg Cys Pro Lys Gln Tyr Lys His Tyr Cys Ile Lys  
 35 40 45  
 Gly Arg Cys Arg Phe Val Val Ala Glu Gln Thr Pro Ser Cys Val Cys  
 50 55 60  
 Asp Glu Gly Tyr Ile Gly Ala Arg Cys Glu Arg Val Leu Phe Tyr  
 65 70 75

<210> 6  
 <211> 78  
 <212> PRT  
 <213> Artificial sequence

&lt;220&gt;

&lt;223&gt; amino acid sequence of betacellulin mutein (BTC 1-76, 78, 79)

&lt;400&gt; 6

Asp	Gly	Asn	Ser	Thr	Arg	Ser	Pro	Glu	Thr	Asn	Gly	Leu	Leu	Cys	Gly
1				5					10					15	
Asp	Pro	Glu	Glu	Asn	Cys	Ala	Ala	Thr	Thr	Thr	Gln	Ser	Lys	Arg	Lys
			20					25					30		
Gly	His	Phe	Ser	Arg	Cys	Pro	Lys	Gln	Tyr	Lys	His	Tyr	Cys	Ile	Lys
		35					40					45			
Gly	Arg	Cys	Arg	Phe	Val	Val	Ala	Glu	Gln	Thr	Pro	Ser	Cys	Val	Cys
	50					55					60				
Asp	Glu	Gly	Tyr	Ile	Gly	Ala	Arg	Cys	Glu	Arg	Val	Leu	Phe		
65					70					75					

&lt;210&gt; 7

&lt;211&gt; 77

&lt;212&gt; PRT

&lt;213&gt; Artificial sequence

&lt;220&gt;

&lt;223&gt; amino acid sequence of betacellulin mutein (BTC 1-76, 78)

&lt;400&gt; 7

Asp	Gly	Asn	Ser	Thr	Arg	Ser	Pro	Glu	Thr	Asn	Gly	Leu	Leu	Cys	Gly
1				5					10					15	
Asp	Pro	Glu	Glu	Asn	Cys	Ala	Ala	Thr	Thr	Thr	Gln	Ser	Lys	Arg	Lys
			20					25					30		
Gly	His	Phe	Ser	Arg	Cys	Pro	Lys	Gln	Tyr	Lys	His	Tyr	Cys	Ile	Lys
		35					40					45			
Gly	Arg	Cys	Arg	Phe	Val	Val	Ala	Glu	Gln	Thr	Pro	Ser	Cys	Val	Cys
	50					55					60				
Asp	Glu	Gly	Tyr	Ile	Gly	Ala	Arg	Cys	Glu	Arg	Val	Leu			
65					70					75					

&lt;210&gt; 8

&lt;211&gt; 79

&lt;212&gt; PRT

&lt;213&gt; Artificial sequence

&lt;220&gt;

&lt;223&gt; amino acid sequence of betacellulin mutein (BTC 1-77, 79, 80)

&lt;400&gt; 8

Asp	Gly	Asn	Ser	Thr	Arg	Ser	Pro	Glu	Thr	Asn	Gly	Leu	Leu	Cys	Gly
1				5					10					15	
Asp	Pro	Glu	Glu	Asn	Cys	Ala	Ala	Thr	Thr	Thr	Gln	Ser	Lys	Arg	Lys
			20					25					30		
Gly	His	Phe	Ser	Arg	Cys	Pro	Lys	Gln	Tyr	Lys	His	Tyr	Cys	Ile	Lys
		35					40					45			
Gly	Arg	Cys	Arg	Phe	Val	Val	Ala	Glu	Gln	Thr	Pro	Ser	Cys	Val	Cys
	50					55					60				

Asp Glu Gly Tyr Ile Gly Ala Arg Cys Glu Arg Val Asp Phe Tyr  
 65 70 75

<210> 9

<211> 78

<212> PRT

<213> Artificial sequence

<220>

<223> amino acid sequence of betacellulin mutein (BTC 1-77, 80)

<400> 9

Asp Gly Asn Ser Thr Arg Ser Pro Glu Thr Asn Gly Leu Leu Cys Gly  
 1 5 10 15  
 Asp Pro Glu Glu Asn Cys Ala Ala Thr Thr Gln Ser Lys Arg Lys  
 20 25 30  
 Gly His Phe Ser Arg Cys Pro Lys Gln Tyr Lys His Tyr Cys Ile Lys  
 35 40 45  
 Gly Arg Cys Arg Phe Val Val Ala Glu Gln Thr Pro Ser Cys Val Cys  
 50 55 60  
 Asp Glu Gly Tyr Ile Gly Ala Arg Cys Glu Arg Val Asp Phe  
 65 70 75

<210> 10

<211> 49

<212> PRT

<213> Artificial sequence

<220>

<223> amino acid sequence of betacellulin mutein (BTC 31-76, 78-80)

<400> 10

Arg Lys Gly His Phe Ser Arg Cys Pro Lys Gln Tyr Lys His Tyr Cys  
 1 5 10 15  
 Ile Lys Gly Arg Cys Arg Phe Val Val Ala Glu Gln Thr Pro Ser Cys  
 20 25 30  
 Val Cys Asp Glu Gly Tyr Ile Gly Ala Arg Cys Glu Arg Val Leu Phe  
 35 40 45  
 Tyr

<210> 11

<211> 48

<212> PRT

<213> Artificial sequence

<220>

<223> amino acid sequence of betacellulin mutein (BTC 31-76, 78, 79)

<400> 11

Arg Lys Gly His Phe Ser Arg Cys Pro Lys Gln Tyr Lys His Tyr Cys  
 1 5 10 15  
 Ile Lys Gly Arg Cys Arg Phe Val Val Ala Glu Gln Thr Pro Ser Cys

		20						25					30				
Val	Cys	Asp	Glu	Gly	Tyr	Ile	Gly	Ala	Arg	Cys	Glu	Arg	Val	Leu	Phe		
		35					40					45					

&lt;210&gt; 12

&lt;211&gt; 47

&lt;212&gt; PRT

&lt;213&gt; Artificial sequence

&lt;220&gt;

&lt;223&gt; amino acid sequence of betacellulin mutein (BTC 31-76, 78)

&lt;400&gt; 12

Arg	Lys	Gly	His	Phe	Ser	Arg	Cys	Pro	Lys	Gln	Tyr	Lys	His	Tyr	Cys		
1			5						10					15			
Ile	Lys	Gly	Arg	Cys	Arg	Phe	Val	Val	Ala	Glu	Gln	Thr	Pro	Ser	Cys		
		20					25					30					
Val	Cys	Asp	Glu	Gly	Tyr	Ile	Gly	Ala	Arg	Cys	Glu	Arg	Val	Leu			
		35					40					45					

&lt;210&gt; 13

&lt;211&gt; 49

&lt;212&gt; PRT

&lt;213&gt; Artificial sequence

&lt;220&gt;

&lt;223&gt; amino acid sequence of betacellulin mutein (BTC 31-77, 79, 80)

&lt;400&gt; 13

Arg	Lys	Gly	His	Phe	Ser	Arg	Cys	Pro	Lys	Gln	Tyr	Lys	His	Tyr	Cys		
1			5						10					15			
Ile	Lys	Gly	Arg	Cys	Arg	Phe	Val	Val	Ala	Glu	Gln	Thr	Pro	Ser	Cys		
		20					25					30					
Val	Cys	Asp	Glu	Gly	Tyr	Ile	Gly	Ala	Arg	Cys	Glu	Arg	Val	Asp	Phe		
		35					40					45					

Tyr

&lt;210&gt; 14

&lt;211&gt; 48

&lt;212&gt; PRT

&lt;213&gt; Artificial sequence

&lt;220&gt;

&lt;223&gt; amino acid sequence of betacellulin mutein (BTC 31-77, 79)

&lt;400&gt; 14

Arg	Lys	Gly	His	Phe	Ser	Arg	Cys	Pro	Lys	Gln	Tyr	Lys	His	Tyr	Cys		
1			5						10					15			
Ile	Lys	Gly	Arg	Cys	Arg	Phe	Val	Val	Ala	Glu	Gln	Thr	Pro	Ser	Cys		
		20					25					30					
Val	Cys	Asp	Glu	Gly	Tyr	Ile	Gly	Ala	Arg	Cys	Glu	Arg	Val	Asp	Phe		
		35					40					45					

<210> 15  
 <211> 231  
 <212> DNA  
 <213> Human

<400> 15  
 gatgggaatt ccaccagaag tcttgaaact aatggcctcc tctgtggaga ccctgaggaa 60  
 aactgtgcag ctaccaccac acaatcaaag cggaaaggcc acttctctag gtgcccgaag 120  
 caatacaagc attactgcat caaagggaga tgccgcttcg tgggtggccga gcagacgccc 180  
 tctgtgtct gtgatgaagg ctacattgga gcaaggtgtg agagagttga c 231

<210> 16  
 <211> 228  
 <212> DNA  
 <213> Human

<400> 16  
 gatgggaatt ccaccagaag tcttgaaact aatggcctcc tctgtggaga ccctgaggaa 60  
 aactgtgcag ctaccaccac acaatcaaag cggaaaggcc acttctctag gtgcccgaag 120  
 caatacaagc attactgcat caaagggaga tgccgcttcg tgggtggccga gcagacgccc 180  
 tctgtgtct gtgatgaagg ctacattgga gcaaggtgtg agagagtt 228

<210> 17  
 <211> 141  
 <212> DNA  
 <213> Human

<400> 17  
 cggaaaggcc acttctctag gtgcccgaag caatacaagc attactgcat caaagggaga 60  
 tgccgcttcg tgggtggccga gcagacgccc tctgtgtct gtgatgaagg ctacattgga 120  
 gcaaggtgtg agagagttga c 141

<210> 18  
 <211> 138  
 <212> DNA  
 <213> Human

<400> 18  
 cggaaaggcc acttctctag gtgcccgaag caatacaagc attactgcat caaagggaga 60  
 tgccgcttcg tgggtggccga gcagacgccc tctgtgtct gtgatgaagg ctacattgga 120  
 gcaaggtgtg agagagtt 138

<210> 19  
 <211> 237  
 <212> DNA  
 <213> Artificial sequence

<220>  
 <223> base sequence of cDNA encoding betacellulin mutein represented by S  
 EQ ID NO: 5

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<400> 19
gatgggaatt ccaccagaag tctgaaact aatggcctcc tctgtggaga ccctgaggaa 60
aactgtgcag ctaccaccac acaatcaaag cggaaaggcc acttctctag gtgcccgaag 120
caatacaagc attactgcat caaagggaga tgccgcttcg tgggtggccga gcagacgccc 180
tctgtgtct gtgatgaagg ctacattgga gcaagggtgtg agagagtttt gttttac 237

<210> 20
<211> 234
<212> DNA
<213> Artificial sequence

<220>
<223> base sequence of cDNA encoding betacellulin mutein represented by S
EQ ID NO: 6

<400> 20
gatgggaatt ccaccagaag tctgaaact aatggcctcc tctgtggaga ccctgaggaa 60
aactgtgcag ctaccaccac acaatcaaag cggaaaggcc acttctctag gtgcccgaag 120
caatacaagc attactgcat caaagggaga tgccgcttcg tgggtggccga gcagacgccc 180
tctgtgtct gtgatgaagg ctacattgga gcaagggtgtg agagagtttt gttt 234

<210> 21
<211> 231
<212> DNA
<213> Artificial sequence

<220>
<223> base sequence of cDNA encoding betacellulin mutein represented by S
EQ ID NO: 7

<400> 21
gatgggaatt ccaccagaag tctgaaact aatggcctcc tctgtggaga ccctgaggaa 60
aactgtgcag ctaccaccac acaatcaaag cggaaaggcc acttctctag gtgcccgaag 120
caatacaagc attactgcat caaagggaga tgccgcttcg tgggtggccga gcagacgccc 180
tctgtgtct gtgatgaagg ctacattgga gcaagggtgtg agagagtttt g 231

<210> 22
<211> 237
<212> DNA
<213> Artificial sequence

<220>
<223> base sequence of cDNA encoding betacellulin mutein represented by S
EQ ID NO: 8

<400> 22
gatgggaatt ccaccagaag tctgaaact aatggcctcc tctgtggaga ccctgaggaa 60
aactgtgcag ctaccaccac acaatcaaag cggaaaggcc acttctctag gtgcccgaag 120
caatacaagc attactgcat caaagggaga tgccgcttcg tgggtggccga gcagacgccc 180
tctgtgtct gtgatgaagg ctacattgga gcaagggtgtg agagagttga cttttac 237

<210> 23

```

<211> 234  
 <212> DNA  
 <213> Artificial sequence

<220>

<223> base sequence of cDNA encoding betacellulin mutein represented by S  
 EQ ID NO: 9

<400> 23

gatgggaatt ccaccagaag tcttgaaact aatggcctcc tctgtggaga ccctgaggaa 60  
 aactgtgcag ctaccaccac acaatcaaag cggaaaggcc acttctctag gtgccccaaag120  
 caatacaagc attactgcat caaagggaga tgccgcttcg tgggtggccga gcagacgccc180  
 tctgtgtct gtgatgaagg ctacattgga gcaaggtgtg agagagttga cttt 234

<210> 24  
 <211> 147  
 <212> DNA  
 <213> Artificial sequence

<220>

<223> base sequence of cDNA encoding betacellulin mutein represented by S  
 EQ ID NO: 10

<400> 24

cggaaaggcc acttctctag gtgccccaaag caatacaagc attactgcat caaagggaga 60  
 tgccgcttcg tgggtggccga gcagacgccc tctgtgtct gtgatgaagg ctacattgga 120  
 gcaaggtgtg agagagtttt gttttac 147

<210> 25  
 <211> 144  
 <212> DNA  
 <213> Artificial sequence

<220>

<223> base sequence of cDNA encoding betacellulin mutein represented by S  
 EQ ID NO: 11

<400> 25

cggaaaggcc acttctctag gtgccccaaag caatacaagc attactgcat caaagggaga 60  
 tgccgcttcg tgggtggccga gcagacgccc tctgtgtct gtgatgaagg ctacattgga 120  
 gcaaggtgtg agagagtttt gttt 144

<210> 26  
 <211> 141  
 <212> DNA  
 <213> Artificial sequence

<220>

<223> base sequence of cDNA encoding betacellulin mutein represented by S  
 EQ ID NO: 12

<400> 26



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cggaaaggcc acttctctag gtgcccgaag caatacaagc attactgcat caaagggaga 60
tgccgcttcg tgggtggccga gcagacgccc tcctgtgtct gtgatgaagg ctacattgga 120
gcaaggtgtg agagagtttt g 141

```

```

<210> 27
<211> 147
<212> DNA
<213> Artificial sequence

```

```

<220>
<223> base sequence of cDNA encoding betacellulin mutein represented by S
EQ ID NO: 13

```

```

<400> 27
cggaaaggcc acttctctag gtgcccgaag caatacaagc attactgcat caaagggaga 60
tgccgcttcg tgggtggccga gcagacgccc tcctgtgtct gtgatgaagg ctacattgga 120
gcaaggtgtg agagagttga cttttac 147

```

```

<210> 28
<211> 144
<212> DNA
<213> Artificial sequence

```

```

<220>
<223> base sequence of cDNA encoding betacellulin mutein represented by S
EQ ID NO: 14

```

```

<400> 28
cggaaaggcc acttctctag gtgcccgaag caatacaagc attactgcat caaagggaga 60
tgccgcttcg tgggtggccga gcagacgccc tcctgtgtct gtgatgaagg ctacattgga 120
gcaaggtgtg agagagttga cttt 144

```

```

<210> 29
<211> 31
<212> DNA
<213> Artificial Sequence

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<220>
<223> Primer 1

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<400> 29
catatggatg ggaattccac cagaagtcct g 31

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```

<210> 30
<211> 33
<212> DNA
<213> Artificial Sequence

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```

<220>
<223> Primer 2

```

```

<400> 30

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ggatccctag tcaactctct cacaccttgc tcc 33

<210> 31  
 <211> 24  
 <212> DNA  
 <213> Artificial Sequence

<220>  
 <223> Primer RI-1

<400> 31  
 agagtcaagg atcccccaac cact 24

<210> 32  
 <211> 22  
 <212> DNA  
 <213> Artificial Sequence

<220>  
 <223> Primer RI-3

<400> 32  
 agctggtcac ttagggctgg gg 22

<210> 33  
 <211> 26  
 <212> DNA  
 <213> Artificial Sequence

<220>  
 <223> Primer RI-1Cla

<400> 33  
 gaatcgatag agtcaaggat ccccca 26

<210> 34  
 <211> 22  
 <212> DNA  
 <213> Artificial Sequence

<220>  
 <223> Primer RI-3Xho

<400> 34  
 gactcgagct ggtcacttag gg 22

<210> 35  
 <211> 80  
 <212> PRT  
 <213> Human

<400> 35

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Asp Gly Asn Ser Thr Arg Ser Pro Glu Thr Asn Gly Leu Leu Cys Gly
1      5      10      15
Asp Pro Glu Glu Asn Cys Ala Ala Thr Thr Thr Gln Ser Lys Arg Lys
      20      25      30
Gly His Phe Ser Arg Cys Pro Lys Gln Tyr Lys His Tyr Cys Ile Lys
      35      40      45
Gly Arg Cys Arg Phe Val Val Ala Glu Gln Thr Pro Ser Cys Val Cys
      50      55      60
Asp Glu Gly Tyr Ile Gly Ala Arg Cys Glu Arg Val Asp Leu Phe Tyr
65      70      75      80

```

<210> 36  
 <211> 240  
 <212> DNA  
 <213> Human

<400> 36  
 gatgggaatt ccaccagaag tcctgaaact aatggcctcc tctgtggaga ccctgaggaa 60  
 aactgtgcag ctaccaccac acaatcaaag cggaaaggcc acttctctag gtgccccaaag 120  
 caatacaagc attactgcat caaagggaga tgccgcttcg tggtaggccga gcagacgccc 180  
 tcctgtgtct gtgatgaagg ctacattgga gcaaggtgtg agagagttga cttgttttac 240

<210> 37  
 <211> 75  
 <212> PRT  
 <213> Human

```

<400> 37
Gly Asn Ser Thr Arg Ser Pro Glu Thr Asn Gly Leu Leu Cys Gly Asp
1      5      10      15
Pro Glu Glu Asn Cys Ala Ala Thr Thr Thr Gln Ser Lys Arg Lys Gly
      20      25      30
His Phe Ser Arg Cys Pro Lys Gln Tyr Lys His Tyr Cys Ile Lys Gly
      35      40      45
Arg Cys Arg Phe Val Val Ala Glu Gln Thr Pro Ser Cys Val Cys Asp
      50      55      60
Glu Gly Tyr Ile Gly Ala Arg Cys Glu Arg Val
65      70      75

```

<210> 38  
 <211> 53  
 <212> PRT  
 <213> Human

```

<400> 38
Ala Thr Thr Thr Gln Ser Lys Arg Lys Gly His Phe Ser Arg Cys Pro
1      5      10      15
Lys Gln Tyr Lys His Tyr Cys Ile Lys Gly Arg Cys Arg Phe Val Val
      20      25      30
Ala Glu Gln Thr Pro Ser Cys Val Cys Asp Glu Gly Tyr Ile Gly Ala
      35      40      45
Arg Cys Glu Arg Val

```

50                      53

<210> 39  
 <211> 30  
 <212> DNA  
 <213> Artificial Sequence

<220>  
 <223> Primer 3

<400> 39  
 cagcatatgg ggaattccac cagaagtcct 30

<210> 40  
 <211> 34  
 <212> DNA  
 <213> Artificial Sequence

<220>  
 <223> Primer 4

<400> 40  
 ggatccctaa actctctcac accttgctcc aatg 34

<210> 41  
 <211> 30  
 <212> DNA  
 <213> Artificial Sequence

<220>  
 <223> Primer 5

<400> 41  
 cagcatatgg ctaccaccac acaatcaaag 30

<210> 42  
 <211> 225  
 <212> DNA  
 <213> Human

<400> 42  
 gggaattcca ccagaagtcc tgaaactaat ggcctcctct gtggagaccc tgaggaaaac 60  
 tgtgcagcta ccaccacaca atcaaagcgg aaaggccact tctctaggtg cccaagcaa 120  
 tacaagcatt actgcatcaa agggagatgc cgcttcgtgg tggccgagca gacgccctcc 180  
 tgtgtctgtg atgaaggcta cattggagca aggtgtgaga gagtt 225

<210> 43  
 <211> 159  
 <212> DNA  
 <213> Human

<400> 43

```
cctaccacca cacaatcaaa ccccaaacc cacttctcta cctcccccaa ccaatacaac 60
cattactcca tcaaaccac atcccccttc ctccctcccc accacacccc ctccctctctc 120
tctcatcaac cctacattcc accaacctct cacacactt 159
```

<210> 44  
 <211> 53  
 <212> PRT  
 <213> Artificial sequence

<220>  
 <223> amino acid sequence of betacwelluin mutein (BTC 31-58, Asn, Pro, Ser, 59-80)

```
<400> 44
Arg Lys Gly His Phe Ser Arg Cys Pro Lys Gln Tyr Lys His Tyr Cys
           5              10              15
Ile Lys Gly Arg Cys Arg Phe Val Val Ala Glu Gln Asn Pro Ser Thr
           20              25              30
Pro Ser Cys Val Cys Asp Glu Gly Tyr Ile Gly Ala Arg Cys Glu Arg
           35              40              45
Val Asp Leu Phe Tyr
           50
```

<210> 45  
 <211> 48  
 <212> PRT  
 <213> Artificial sequence

<220>  
 <223> amino acid sequence of betacwelluin mutein (Asn, Ser, Asp, Ser, Glu, BTC38-80)

```
<400> 45
Asn Ser Asp Ser Glu Cys Pro Lys Gln Tyr Lys His Tyr Cys Ile Lys
           5              10              15
Gly Arg Cys Arg Phe Val Val Ala Glu Gln Thr Pro Ser Cys Val Cys
           20              25              30
Asp Glu Gly Tyr Ile Gly Ala Arg Cys Glu Arg Val Asp Leu Phe Tyr
           35              40              45
```

<210> 46  
 <211> 83  
 <212> PRT  
 <213> Artificial sequence

<220>  
 <223> amino acid sequence of betacwelluin mutein (BTC 1-58, Asn, Pro, Ser, 59-80)

```
<400> 46
Asp Gly Asn Ser Thr Arg Ser Pro Glu Thr Asn Gly Leu Leu Cys Gly
  1              5              10              15
```

Asp	Pro	Glu	Glu	Asn	Cys	Ala	Ala	Thr	Thr	Thr	Gln	Ser	Lys	Arg	Lys
		20						25					30		
Gly	His	Phe	Ser	Arg	Cys	Pro	Lys	Gln	Tyr	Lys	His	Tyr	Cys	Ile	Lys
		35					40					45			
Gly	Arg	Cys	Arg	Phe	Val	Val	Ala	Glu	Gln	Asn	Pro	Ser	Thr	Pro	Ser
	50					55					60				
Cys	Val	Cys	Asp	Glu	Gly	Tyr	Ile	Gly	Ala	Arg	Cys	Glu	Arg	Val	Asp
65					70					75					80
Leu	Phe	Tyr													

<210> 47  
 <211> 249  
 <212> DNA  
 <213> Artificial sequence

<220>  
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 EQ ID NO: 46

<400> 47  
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 caatacaagc attactgcat caaagggaga tgccgcttcg tgggtggccga gcagaacccc 180  
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 ttgttttac 249

<210> 48  
 <211> 159  
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<220>  
 <223> base sequence of cDNA encoding betacellulin mutein represented by S  
 EQ ID NO: 44

<400> 48  
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 tacattggag caaggtgtga gagagttgac ttgttttac 159

<210> 49  
 <211> 144  
 <212> DNA  
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<220>  
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 EQ ID NO: 45

<400> 49  
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 ttcggtggtg ccgagcagac gccctcctgt gtctgtgatg aaggctacat tggagcaagg 120

tgtgagagag ttgacttggt ttac 144

<210> 50

<211> 30

<212> DNA

<213> Artificial Sequence

<220>

<223> Primer BT-95h

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<211> 30

<212> DNA

<213> Artificial Sequence

<220>

<223> Primer BT-94h

<400> 51

ctggatccta gtaaaacaag tcaactctct 30

<210> 52

<211> 30

<212> DNA

<213> Artificial Sequence

<220>

<223> Primer PET-1

<400> 52

gaaataattt tgtttaactt taagaaggag 30

<210> 53

<211> 30

<212> DNA

<213> Artificial Sequence

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<223> Primer BTC-1

<400> 53

aggagggcgt cgaggggttc tgctcggcca 30

<210> 54

<211> 30

<212> DNA

<213> Artificial Sequence

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<223> Primer BTC-2

<400> 54

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30

<210> 55

<211> 30

<212> DNA

<213> Artificial Sequence

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<223> Primer BTC-3

<400> 55

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<210> 56

<211> 35

<212> DNA

<213> Artificial Sequence

<220>

<223> Primer BTC-7

<400> 56

tatacatatg aacagcgact ctgagtgtccc caagc

35

<210> 57

<211> 40

<212> PRT

<213> Human

<400> 57

Asp Gly Asn Ser Thr Arg Ser Pro Glu Thr Asn Gly Leu Leu Cys Gly

1

5

10

15

Asp Pro Glu Glu Asn Cys Ala Ala Thr Thr Thr Gln Ser Lys Arg Lys

20

25

30

Gly His Phe Ser Arg Cys Pro Lys

35

40

<210> 58

<211> 36

<212> PRT

<213> Human

<400> 58

Gln Tyr Lys His Tyr Cys Ile Lys Gly Arg Cys Arg Phe Val Val Ala

1

5

10

15

Glu Gln Thr Pro Ser Cys Val Cys Asp Glu Gly Tyr Ile Gly Ala Arg

20

25

30

Cys Glu Arg Val

35



<210> 59  
 <211> 37  
 <212> PRT  
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<400> 59  
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 Gly His Phe Ser Arg  
 35

<210> 60  
 <211> 39  
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 <213> Human

<400> 60  
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 Val Val Ala Glu Gln Thr Pro Ser Cys Val Cys Asp Glu Gly Tyr Ile  
 20 25 30  
 Gly Ala Arg Cys Glu Arg Val  
 35

<210> 61  
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 <212> PRT  
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<400> 61  
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 Pro Glu Glu Asn Cys Ala Ala Thr Thr Thr Gln Ser Lys Arg Lys Gly  
 20 25 30  
 His Phe Ser Arg Cys Pro Lys Gln Tyr Lys His Tyr Cys Ile Lys Gly  
 35 40 45  
 Arg Cys Arg Phe Val Val Ala Glu Gln Thr Pro Ser Cys Val Cys Asp  
 50 55 60  
 Glu Gly Tyr Ile Gly Ala Arg Cys Glu Arg Val  
 65 70 75

<210> 62  
 <211> 23  
 <212> PRT  
 <213> Human

<400> 62  
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Asp Pro Glu Glu Asn Cys Ala  
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<210> 63  
<211> 53  
<212> PRT  
<213> Human

<400> 63  
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Lys Gln Tyr Lys His Tyr Cys Ile Lys Gly Arg Cys Arg Phe Val Val  
20 25 30  
Ala Glu Gln Thr Pro Ser Cys Val Cys Asp Glu Gly Tyr Ile Gly Ala  
35 40 45  
Arg Cys Glu Arg Val  
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<210> 64  
<211> 30  
<212> PRT  
<213> Human

<400> 64  
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Asp Pro Glu Glu Asn Cys Ala Ala Thr Thr Thr Gln Ser Lys  
20 25 30